

Notice of Allowability

Application No.

10/677,166

Examiner

EARL N. TAYLOR

Applicant(s)

UZOH ET AL.

Art Unit

2818

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS. This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to papers filed 11 February 2009.
2. ☒ The allowed claim(s) is/are 1-62.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

/DAVID VU/
Primary Examiner, Art Unit 2818

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Burton Amernick on 12 February 2009.

The application has been amended as follows:

Please amend the paragraph beginning at column 2, line 48 to read as follows:

An additional advantage of the present invention is that it may provide higher productivity as compared to known processes.

Please amend the paragraph beginning at column 5, line 38 to read as follows:

Next, a conductive barrier 11 may be provided over the insulating layer. Preferably, the conductive barrier may include a layer of tantalum nitride first sputter deposited over the insulating layer, the walls of the recess, and the exposed conductive feature to a thickness of about 15 Å to about 500 Å and more typically to a thickness of about 50 to about 300 to act as adhesion promoting layer between the insulating layer and subsequently to be applied tantalum layer. Then, a tantalum layer may be sputtered over the layer of tantalum nitride, where it may form α -Ta spontaneously. Typically, the thickness of the tantalum layer is about 500 Å to about 3000 Å and more typically about 1000 Å to about 2000 Å. Also, α -Ta may be deposited directly over the insulator by sputtering methods. Typically, the thickness of the α -Ta is about 500 Å to about 5000 Å, and more typically about 1000 Å to about 3000.

Please amend the paragraph beginning at column 6, line 3 to read as follows:

After formation of the seed layer, a photoresist may be deposited over the seed layer.

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Any of the well known photosensitive resist materials known in the art can be employed. The resist is typically applied by spinning on or by spraying.

Please amend the paragraph beginning at column 6, line 23 to read as follows:

The photoresist may be selectively removed everywhere except for in the recess(es). The resist remaining in the recess(es) may [protects] protect the seed layer in the recesses (both the side walls and bottom of the recesses). The seed layer lying outside of the recesses may be removed simultaneously with the photoresist. Actually, since the seed layer lies under the photoresist, the seed layer may be removed subsequent to the removal of the photoresist. They may be removed by the same process.

Please amend the paragraph bridging columns 6 and 7 to read as follows:

The electroplating is continued until a desired amount of the conductive metal is plated in the recess(es). This usually takes about 10 min. to about 90 min, more typically about 20 min. to about 75 min. The thickness of the electroplated metal or alloy is typically about 25 μ to about 200 μ , and more typically about 40 μ to about 75 μ .

Please amend the paragraph bridging columns 5 and 6 to read as follows:

After the deposition of the barrier layer, a seed layer 13 may be deposited over the barrier layer 11 including on the walls and bottom of the recess(es). The preferred seed layer is copper, which can be deposited by sputtering or evaporation and preferably by sputtering. The copper may be sputtered employing temperatures of less than about 150° C, preferably less than about 100° C, such as about 100° C to about -10° C. The sputtering may be carried out in the absence of an anneal. The sputtering is typically carried out to provide a seed layer of about 100 Å to about 2000 Å and preferably about 400 Å to about 1000 Å. Also, the copper seed layer may be deposited by CVD methods or by electroless plating method or by an electrolytic plating method.

Allowable Subject Matter

The following is an examiner's statement of reasons for allowance:

Regarding Claims 1 and 24, the prior art of record alone or in combination neither teaches nor makes obvious the invention of electroplating a second metal to the plating seed layer in the recess without utilizing a lithographic mask in combination with all of the limitations of Claims 1 and 24 respectively.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Telephone / Fax Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Earl N. Taylor whose telephone number is (571) 272-8894. The examiner can normally be reached on Monday-Friday from 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Loke can be reached on (571) 272-1657. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

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For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Examiner: Earl N. Taylor

/DAVID VU/
Primary Examiner, Art Unit 2818